



Designation: A 787 – 001

An American National Standard

## Standard Specification for Electric-Resistance-Welded Metallic-Coated Carbon Steel Mechanical Tubing<sup>1</sup>

This standard is issued under the fixed designation A 787; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers round, square, rectangular, and special shape, electric-resistance-welded mechanical tubing, either zinc-coated (galvanized) after welding or produced from aluminum-coated, zinc-coated (galvanized), zinc-iron alloy-coated (galvannealed), or 55 % aluminum-zinc alloy-coated steel sheet. Tubing for use as electrical conduit (EMT) or intermediate metallic conduit (IMC) is not covered by this specification.

1.2 This specification covers mechanical tubing with outside diameters or maximum outside dimensions ranging from ½ to 8 in. (12.7 to 203.2 mm) and wall thickness from 0.028 to 0.134 in. (0.71 to 3.40 mm).

1.3 Sizes outside the ranges listed above may be ordered provided all other requirements of the specification are met.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

### 2. Referenced Documents

#### 2.1 *ASTM Standards:*

A 90/A 90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings<sup>2</sup>

---

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.09 on Carbon Steel Tubular Products.

Current edition approved ~~Sept. 10, 2000~~<sup>1</sup> March 10, 2000. Published ~~November 2000~~<sup>1</sup> May 2001. Originally published as A 787 – 81. Last previous edition A 787 – ~~96~~<sup>00</sup>.

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products<sup>3</sup>

A 428/A 428M Test Method for Weight of Coating on Aluminum-Coated Iron or Steel Articles<sup>2</sup>

A 463/A 463M Specification for Steel Sheet, Aluminum-Coated by the Hot-Dip Process<sup>2</sup>

A 653/A 653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process<sup>2</sup>

A 792/A 792M Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process<sup>2</sup>

A 924/A 924M Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process<sup>2</sup>

B 6 Specification for Zinc<sup>4</sup>

### 3. Classification

3.1 The types of tubing covered by this specification are:

Type Number	Code Letters	Description
1	AWAC	electric-resistance-welded aluminum-coated carbon steel mechanical tubing
2	AWG	electric-resistance-welded galvanized carbon steel mechanical tubing
3	AWPG	electric-resistance-welded carbon steel mechanical tubing, post-hot dipped galvanized
4	AWGA	electric-resistance-welded carbon steel mechanical tubing, zinc-iron alloy-coated (galvannealed)
5	AWGZ	electric-resistance-welded carbon steel mechanical tubing, 55 % aluminum-zinc alloy-coated

### 4. Ordering Information

4.1 The ordered wall thickness of the tubing shall be the total of the base metal and the metallic coating.

4.2 Orders for material under this specification shall include the following:

4.2.1 Quantity (feet, metres, or number of lengths),

4.2.2 Type, code letters, and description (Sections 1 and 3),

4.2.3 Applicable ASTM designation number(s),

4.2.4 Coating designation and type of coating,

4.2.5 Chemically treated or not chemically treated raw material,

4.2.6 Oiled or dry (Section 16),

4.2.7 Extra smooth coating (if required),

4.2.8 Customer application, including fabrication,

4.2.9 Flash condition (7.1),

4.2.10 Steel grade designation (Sections 5 and 9),

4.2.11 Report of chemical analysis if required (Sections 10 and 11),

4.2.12 Shape (round, square, rectangular, or special),

4.2.12.1 Dimensions: round—any two of the following: inside diameter, outside diameter, or wall thickness; square or rectangular—outside dimension, wall thickness, and corner radii, if required. (See 12.1 and 13.1 and 13.2.)

4.2.13 Length: round tubing—mill lengths or definite cut lengths (see 12.2); square and rectangular tubing—mill cut lengths and specified length (see 13.4).

4.2.14 Squareness of cut: round tubing, if required (see 12.3); square and rectangular tubing, if required (see 13.7),

4.2.15 Burrs removed, if required (see 15.2),

4.2.16 Special packaging (Section 19),

4.2.17 Customer specification number, if applicable,

4.2.18 Special requirements,

4.2.19 Special marking (Section 18), and

4.2.20 Recoating of outside diameter weld and heat-affected area, on precoated steel, if required.

### 5. Process

5.1 The steel shall be made from any process.

5.1.1 If a specific type of melting is required by the purchaser, it shall be stated on the purchase order.

<sup>2</sup> Annual Book of ASTM Standards, Vol 01.06.

<sup>3</sup> Annual Book of ASTM Standards, Vol 01.03.

<sup>4</sup> Annual Book of ASTM Standards, Vol 02.04.

5.1.2 The primary melting may incorporate separate degassing or refining and may be followed by secondary melting, using electroslag remelting or vacuum remelting. If secondary melting is employed, the heat shall be defined as all of the ingots remelted from a single primary heat.

5.1.3 Steel may be cast in ingots or may be strand cast. When steel of different grades is sequentially strand cast, identification of the resultant transition material is required. The producer shall remove the transition material by an established procedure that positively separates the grades.

5.2 For tubing produced from precoated steel sheet, the composition of the coating shall comply with the applicable specification.

5.2.1 *Specification A 463/A 463M*—Coating designation for aluminum coated-sheet.

5.2.2 *Specification A 653/A 653M*—Coating designation for galvanized and galvanized steel sheet.

5.2.3 *Specification A 792/A 792M*—Coating designation for 55 % aluminum-zinc alloy-coated steel sheet.

5.2.4 Other grades of coated steel sheet, as listed in Table 1 and Table 2, may be used as the precoated material for the steel tubing upon agreement between the manufacturer and the purchaser. Such steel sheet shall meet the requirements of Specification A 463/A 463M, A 653/A 653M, A 792/A 792M, and A 924/A 924M, except for the chemical requirements.

## 6. Manufacture

6.1 Tubes shall be made by the electric-resistance welding process and shall be made from hot or cold-rolled precoated steel.

6.2 Special manufacturing practices allow for post-hot dipped galvanizing of welded tubing. If this product is desired all sections of this specification will apply except Table 3. Wall thickness tolerances shall be determined by agreement between the producer and purchaser.

## 7. Flash Conditions

7.1 The flash conditions under which tubing may be furnished are as follows: The flash shall be removed from the outside diameter of tubing covered by this specification. Tubing furnished to this specification may have the following conditions of welding flash on the inside diameter.

7.1.1 *Flash-In*— All tubing in which the inside diameter welding flash does not exceed the wall thickness or  $\frac{3}{32}$  in. (2.4 mm), whichever is less.

7.1.2 *Flash Controlled to 0.010 in. (0.254 mm), Maximum* — Tubing in which the height of the remaining welding flash is controlled so as not to exceed 0.010 in. This condition is available in over 0.750 in. (19.05 mm) outside diameter and gages consistent with Table 4.

7.1.3 *Flash Controlled to 0.005 in. (0.127 mm), Maximum* —When the inside diameter flash is controlled to 0.005 in. (0.127 mm) maximum in tubing produced to outside diameter and wall thickness, inside diameter and wall thickness, or outside diameter and inside diameter tolerances, the remaining inside diameter flash, if any, is part of the applicable inside diameter tolerance. This controlled flash is available in 0.750 in. (19.05 mm) outside diameter or greater.

7.2 Tubes shall be furnished in the following shapes, as specified by the purchaser: round, square, rectangular, or special shapes (as negotiated).

7.3 Recoating of the outside diameter weld-heat-affected area on precoated steel tubing may be performed at the manufacture's option, if not specifically requested by the purchaser.

## 8. Surface Finish

8.1 Special surface finishes as may be required for specific applications shall be provided in the purchase order by agreement between the producer and purchaser.

## 9. Base Metal Chemical Composition

9.1 The chemical composition of the sheet steel base metal shall conform to the requirements of Table 1.

**TABLE 1 Chemical Requirements for Low-Carbon Steels<sup>A,B</sup>**

Grade Designation <sup>C</sup>	Composition, %			
	Carbon	Manganese	Phosphorus, max	Sulfur, max
MT1010	0.05 to 0.15	0.30 to 0.60	0.035	0.035
MT1015	0.10 to 0.20	0.30 to 0.60	0.035	0.035
MTX1015	0.10 to 0.20	0.60 to 0.90	0.035	0.035
MT1020	0.15 to 0.25	0.30 to 0.60	0.035	0.035
MTX1020	0.15 to 0.25	0.70 to 1.00	0.035	0.035

<sup>A</sup> Rimmed or capped steels that may be used for the above grades are characterized by a lack of uniformity in their chemical composition, and for this reason product analysis is not technologically appropriate unless misapplication is clearly indicated.

<sup>B</sup> Chemistry represents heat analysis. Product analysis, except for rimmed or capped steel, is to be in accordance with usual practice as shown in Table 5.

<sup>C</sup> The letters MT indicate mechanical tubing.

**TABLE 2 Chemical Requirements for Other Carbon Steels<sup>A</sup>**

Grade Designation	Composition, %			
	Carbon	Manganese	Phosphorus, max	Sulfur, max
1008	0.10 max	0.50	0.035	0.035
1010	0.08 to 0.13	0.30 to 0.60	0.035	0.035
1015	0.12 to 0.18	0.30 to 0.60	0.035	0.035
1016	0.12 to 0.19	0.60 to 0.90	0.035	0.035
1017	0.14 to 0.21	0.30 to 0.60	0.035	0.035
1018	0.14 to 0.21	0.60 to 0.90	0.035	0.035
1019	0.14 to 0.21	0.70 to 1.00	0.035	0.035
1021	0.17 to 0.24	0.60 to 0.90	0.035	0.035

<sup>A</sup> Chemistry represents heat analysis. Product analysis, except for rimmed or capped steel, is to be in accordance with usual practice as shown in Table 5.

**TABLE 3 Wall Thickness Tolerance for Premetallic Coated As-Welded Tubing<sup>A</sup>  
Outside Diameter, in.**

Wall Thickness		½ to 1, incl		Over 1 to 1⅝, incl		Over 1⅝ to 3¾, incl		Over 3¾ to 4½, incl		Over 4½ to 6, incl		Over 6 to 8, incl	
Wall Thickness Tolerance, in., Plus and Minus													
BWG <sup>B</sup>	in. <sup>C</sup>	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus
22	0.028	0.002	0.006	0.002	0.006								
20	0.035	0.003	0.006	0.002	0.006	0.002	0.006						
18	0.049	0.004	0.007	0.003	0.008	0.003	0.008						
16	0.065	0.005	0.007	0.004	0.008	0.003	0.009	0.003	0.009	0.002	0.010		
14	0.083	0.006	0.008	0.006	0.008	0.005	0.009	0.005	0.009	0.004	0.010	0.004	0.010
13	0.095	0.008	0.010	0.008	0.010	0.007	0.011	0.007	0.011	0.006	0.012	0.006	0.012
12	0.109	0.008	0.010	0.008	0.010	0.007	0.011	0.007	0.011	0.006	0.012	0.006	0.012
11	0.120	0.009	0.011	0.009	0.011	0.008	0.012	0.008	0.012	0.007	0.013	0.007	0.013
10	0.134	0.009	0.011	0.009	0.011	0.008	0.012	0.008	0.012	0.007	0.013	0.007	0.013

<sup>A</sup> Post-hot dipped galvanized welded tubing wall thickness tolerances shall be determined by agreement between the producer and purchaser (6.2).

<sup>B</sup> Birmingham Wire Gage.

<sup>C</sup> 1 in. = 25.4 mm.

9.2 Copper-bearing steel, with 0.20 % minimum copper, may be ordered in any of the grades shown in Table 1 or Table 2.

9.3 An analysis of each heat of steel shall be made by the basic steel producer to determine the percentage of the elements specified. The heat analysis, as supplied by the steel melter, shall conform to the requirements of Table 1 or Table 2.

9.4 When a grade is ordered under this specification, supplying an alloy grade that specifically requires the addition of any element other than those listed for the ordered grade in Table 1 and Table 2 is not permitted.

## 10. Coating Bath Chemical Composition

10.1 When tubing is produced from precoated sheet steel, the tubing manufacturer shall furnish, upon request, a report stating that the tubing has been manufactured from precoated sheet steel meeting one of the following specifications: A 463/A 463M, A 653/A 653M, A 792/A 792M, and A 924/A 924M.

10.2 For post-coated tubing the zinc used for coating shall be any grade of zinc conforming to Specification B 6.

## 11. Product Analysis

11.1 When requested on the purchase order, a product analysis shall be made by the supplier. The number and source of samples for a product analysis shall be based on the individual heat or lot identity of one of the following forms:

11.1.1 *Heat Identity Maintained*—One product analysis per heat shall be made on either the flat-rolled stock or tube.

11.1.2 *Heat Identity Not Maintained*—One product analysis shall be made from each 2000 ft (610 m) or fraction thereof for sizes over 3 in. (76.2 mm) outside diameter, and from each 5000 ft (1524 m) or fraction thereof for sizes 3 in. (76.2 mm) outside diameter and under.

11.2 Samples for product spectrochemical analysis shall be taken in accordance with procedures established with the tube producer and the testing laboratory. The composition thus determined shall correspond to the requirements in Table 1 or Table 2 and be within the composition tolerances shown in Table 5.

11.3 If the original test for product analysis fails, retests of two additional samples of flat-rolled stock or tubes shall be made. Both retests for the elements in question shall meet the requirements of Table 1 or Table 2, and Table 5, of this specification; otherwise, all remaining material in the heat or lot shall be rejected or, at the option of the producer, each length of flat-rolled stock or tube may be individually tested for acceptance. Any retested material not meeting the requirements of this specification shall be rejected.

## 12. Permissible Variations in Dimensions for Round Tubing

12.1 *Wall Thickness and Diameter*—Wall thickness tolerances for tubing made from precoated steel are shown in Table 3. All

**TABLE 4 Diameter Tolerances for Metallic-Coated Round Tubing**

Outside Diameter Range, in. <sup>A</sup>	Wall Thickness		Tubing with Any Inside Flash Condition	Flash-Controlled to 0.005 in. Tubing Only <sup>B</sup>
	BWG <sup>C</sup>	in. <sup>A</sup>	Outside <sup>D,E</sup> Diameter, Plus and Minus	Inside Diameter, Plus and Minus
Tolerances, in. <sup>F</sup>				
½ to 1⅝, incl	22 to 16	0.028/0.065	0.0035	0.019
1⅝ to 2, incl	22 to 14	0.028/0.083	0.005	0.021
1⅝ to 2, incl	13 to 10	0.095/0.134	0.005	0.027
2 to 2½, incl	20 to 14	0.035/0.083	0.006	0.023
2 to 2½, incl	13 to 10	0.095/0.134	0.006	0.029
2½ to 3, incl	20 to 14	0.035/0.083	0.008	0.025
2½ to 3, incl	13 to 10	0.095/0.134	0.008	0.031
3 to 3½, incl	20 to 14	0.035/0.083	0.009	0.026
3 to 3½, incl	13 to 10	0.095/0.134	0.009	0.032
3½ to 4, incl	20 to 14	0.035/0.083	0.010	0.027
3½ to 4, incl	13 to 10	0.095/0.134	0.010	0.033
4 to 5, incl	16 to 14	0.065/0.083	0.020	0.037
4 to 5, incl	13 to 10	0.095/0.134	0.020	0.043
5 to 6, incl	16 to 14	0.065/0.083	0.020	0.037
5 to 6, incl	13 to 10	0.095/0.134	0.020	0.043
6 to 8, incl	14 to 10	0.083/0.134	0.025	0.048

<sup>A</sup> 1 in. = 25.4 mm.

<sup>B</sup> Flash controlled to 0.005 in. maximum tubing is produced to outside diameter tolerances and wall thickness tolerances, inside diameter tolerances and wall thickness tolerances, or outside diameter tolerances and inside diameter tolerances, in which the height of the remaining inside welding flash is controlled not to exceed 0.005 in. Any remaining flash is considered to be part of the applicable inside diameter tolerances.

<sup>C</sup> Birmingham Wire Gage.

<sup>D</sup> Flash-in tubing is produced to outside diameter tolerances and wall thickness tolerances only, and the height of the inside welding flash does not exceed the wall thickness or ⅜ in., whichever is less.

<sup>E</sup> Flash controlled to 0.010 in maximum tubing consists of tubing over ⅝ in. outside diameter which is commonly produced to outside diameter tolerances and wall thickness tolerances only, in which the height of the remaining inside welding flash is controlled not to exceed 0.010 in.

<sup>F</sup> The ovality shall be within the above tolerances except when the wall thickness is less than 3 % of the outside diameter, in which cases see 12.5.

wall thickness tolerances include both the base steel and the coating (inside and outside surfaces). Variations in outside diameter and inside diameter of as-welded tubing made from precoated steel are shown in Table 4.

12.2 *Length*—Mechanical tubing is commonly furnished in mill lengths 5 ft (1.5 m) and over. Mill length tolerances are given in Table 6. Definite cut lengths are furnished when specified by the purchaser. Tolerances for definite length round tubing ~~are~~ shall be given in Table 7 and Table 8. Different types of cutting methods will affect the end cut.

12.3 *Squareness of Cut*—When specified, the tolerance for squareness of cut of round mechanical tubing is shown in Table 8 9. Measurements are made with the use of an “L” square and feeler gage. The contact length of the side leg of the square along the tube will be equal to or greater than the tube outside diameter, but not less than 1 in. (25.4 mm) nor greater than 4 in. (101.6 mm). The other leg shall always be equal to or greater than the tube outside diameter.

12.4 *Straightness*:

12.4.1 *Post-Coated Tubing*—The straightness tolerance for round mechanical tubing shall be 0.030 in. (0.762 mm) maximum

**TABLE 5 Tolerances for Product Analysis for Steels**  
Shown in Table 1<sup>A</sup>

Element	Limit or Maximum of Specified Range, %	Variation, Over the Maximum Limit or Under the Minimum Limit	
		Under min, %	Over max, %
Carbon	to 0.15, incl	0.02	0.03
	over 0.15 to 0.40, incl	0.03	0.04
	over 0.40 to 0.55, incl	0.03	0.05
Manganese	to 0.60, incl	0.03	0.03
	over 0.60 to 1.00 incl	0.04	0.04
Phosphorus	...	...	0.01
Sulfur	...	...	0.01
Copper	...	0.02	...

<sup>A</sup> Individual determinations may vary from the specified heat limits or ranges to the extent shown in this table, except that any element in a heat may not vary both above and below a specified range.

**TABLE 6 Mill Cut-Length Tolerances for Round, Square, and Rectangular Tubing**

Outside Diameter Size, in. <sup>A</sup>	5 ft to Under 24 ft	24 ft and Over <sup>B</sup>
½ to 8, incl	+1.0, -0.0 in.	+4.0, -0.0 in.

<sup>A</sup> 1 in. = 25.4 mm.

<sup>B</sup> Manufacturing practices may limit the length available; therefore, when inquiring, it is essential to describe the product fully.

**TABLE 7 Cut Length Tolerances for Definite Length-Cut Round Tubing**

Outside Diameter Size, in. <sup>A</sup>	6 in. and Under 12 in.	12 in. and Under 48 in.	48 in. and Under 10 ft	10 ft to 24 ft, incl <sup>B</sup>
¾ to 3, incl	± 1/64	± 1/32	± 3/64	± 1/8
Over 3 to 6, incl	± 1/32	± 3/64	± 1/16	± 1/8
Over 6 to 8, incl	± 1/16	± 1/16	± 1/8	± 1/8

<sup>A</sup> 1 in. = 25.4 mm.

<sup>B</sup> For each additional 10 ft or fraction thereof over 24 ft, an additional allowance should be made of ± 1/16 in.

in any 3-ft (0.914-m) length of tubing. The straightness tolerance on shorter lengths and on special requirements shall be agreed upon between the purchaser and producer.

**12.4.2 Precoated Tubing**—The straightness requirement for post-coated tubing shall be by agreement between the purchaser and producer.

**12.5 Ovality**—The ovality shall be within the tolerances of Table 4 except when the wall thickness is less than 3 % of the outside diameter. When the tube wall thickness is less than 3 % of the tube outside diameter the ovality may be 50 % greater than the outside diameter tolerances, but the mean diameter (average of maximum outside diameter and minimum outside diameter) shall be within the specified tolerance.

### 13. Permissible Variations in Dimensions of Square and Rectangular Tubing

**13.1 Diameter and Wall Thickness**—Permissible variations in outside dimensions for square and rectangular tubing are shown in Table 9-10. The wall thickness tolerance is ±10 % of the nominal wall thickness and is measured at the center width of the unwelded sides.

**13.2 Corner Radii**—Unless otherwise specified the inside and outside corners of square and rectangular tubing shall be slightly rounded, consistent with the tube wall thickness. A slight radius flattening can be expected and is more pronounced with heavier-walled tubing. However, the radii of the corners shall be in accordance with Table 10-11.

**13.3 Squareness of Sides**—Permissible variation of squareness of sides shall be determined by the following equation:

$$\pm b = c \times 0.006 \text{ in.}$$

where:

$b$  = tolerance for out-of-square, and

$c$  = largest external dimension across flats.

The squareness of sides is commonly determined by one of the following methods:

**13.3.1** A square with two adjustable contact points on each arm is placed on two sides. A fixed feeler gage is then used to

**TABLE 8 Cut-Length Tolerances for Square Tubing of Circular Cross Section (Either End) When Specified as Disc-Cut Round Tubing<sup>A,B</sup>**

Outside Diameter of Tubing, in. <sup>C,D</sup>	Outside Diameter, in. <sup>B,D</sup>				
Size, ft. in. <sup>A</sup>	Under 4	1 to 2, incl	Over 2 to 3, incl	Over 3 to 4, incl	Over 4
	Under 1	6 in. and under 12 in.	12 in. and under 48 in.	48 in. and under 10 ft.	10 ft. and 24 ft. incl
Under 1	0.006	0.008	0.010	0.015	0.020
1/8 to 3 incl.	± 1/16 in.	± 1/16 in.	± 1/8 in.	± 1/4 in.	0.020
4 to 3, incl	0.008	0.010	0.015	0.020	0.030
Over 3 to 6, incl.	± 1/16 in.	± 1/16 in.	± 1/8 in.	± 1/4 in.	0.030
Over 3 to 6, incl	0.010	0.015	0.020	0.025	0.040
Over 6 to 8, incl.	± 1/16 in.	± 1/16 in.	± 1/8 in.	0.025	0.040
Over 6 to 9, incl	0.015	0.020	0.025	0.030	0.040
Over 6 to 9, ± 1/4 incl	0.015	0.020	0.025	0.030	0.040

<sup>A</sup> Actual squareness normal to length of tube, not parallelness of both ends.

<sup>B</sup> Values given are "go" value of feeler gage. "No-go" value is 0.001 in. greater in each case.

<sup>C</sup> 1 ft. = 0.3 m.

<sup>D</sup> 1 in. = 25.4 mm.

measure the maximum distance between the free contact point and the surface of the tubing.

13.3.2 A square equipped with a direct-reading vernier may be used to determine the angular deviation that, in turn, may be related to distance in inches.

13.4 *Length*—Tolerances for mill cut-length square and rectangular tubing shall not exceed the amounts shown in Table 4. Tolerances for definite length square and rectangular tubing shall not exceed the amount shown in Table 12.

13.5 *Twist*—Twist tolerances are shown in Table 13. The twist in square and rectangular tubing may be measured by holding one end of the tubing on a surface plate and noting the height of either corner of the opposite end of the same side above the surface plate. Twist may also be measured by the use of a beveled protractor equipped with a level, and noting the angular deviation on opposite ends, or at any point throughout the length.

13.6 *Straightness*—The straightness tolerance is 1/16 in. in 3-ft length (1.7 mm/m).

13.7 *Squareness of Cut*—If required, the squareness of cut for square and rectangular tubing shall be equal to or less than 0.050 in. (1.27 mm). Measurements are made with an "L" square and feeler gage. The contact length of the side leg of the square along the tube will be equal to or greater than the largest outside dimension of the tube but shall never be less than 1 in. (25.4 mm) nor greater than 4 in. (101.6 mm). The other leg will always be equal to or greater than the largest outside dimension of the tube.

## 14. Tubing Sections Other Than Square and Rectangular

14.1 In addition to square and rectangular tubing, many producers supply a wide variety of special sections. However, manufacturing practices limit the size range and sections that are available from the various producers. Since the sections are special, they must be inquired on an individual basis giving full details as to dimensions and finish.

## 15. Workmanship, Finish, and Appearance

15.1 The tubing shall have a workmanlike finish.

15.2 When burrs must be removed from one or both ends, it shall be specified in the purchase order.

## 16. Oiling

16.1 When specified, tubing shall have a protective coating applied before shipping to retard white rust of the metallic coating on closely nested products and red rust on non-recoated outside diameter weld areas. Should the order specify shipment without a protective coating, the lubricant incidental to manufacturing will remain and the purchaser will assume responsibility for rust in transit and storage.

## 17. Rejection

17.1 Tubes that fail to meet the requirements of this specification shall be set aside and the producer shall be notified.

## 18. Product Marking

18.1 Each box, bundle, lift, or piece shall be identified by a tag or stencil with the manufacture's name or brand, specified size, type, purchaser's order number, and this specification number.




$$\text{Tubing}^B$$

Largest Outside Diameter, in. <sup>B</sup>		Tolerance at All Sides at Corners, ± in. <sup>BD</sup>	
Nominal Outside Dimension, in. <sup>BC</sup>	Under 1	0.020 to 0.083, incl	0.004
—Over 1 to 1½, incl	0.025 to 0.134, incl		
—Over 1½ to 2, incl	0.13 to 0.209, incl		
—Over 2 to 3, incl	0.20 to 0.315, incl		
—Over 3 to 4, incl	0.31 to 0.425, incl		
—Over 4 to 6, incl	0.42 to 0.635, incl		
—Over 6 to 8, incl	0.63 to 0.845, incl		
—Over 8 to 10, incl	0.84 to 1.055, incl		
—Over 10 to 12, incl	1.05 to 1.265, incl		
—Over 12 to 14, incl	1.26 to 1.475, incl		
—Over 14 to 16, incl	1.47 to 1.685, incl		
—Over 16 to 18, incl	1.68 to 1.895, incl		
—Over 18 to 20, incl	1.89 to 2.105, incl		
—Over 20 to 22, incl	2.10 to 2.315, incl		
—Over 22 to 24, incl	2.31 to 2.525, incl		
—Over 24 to 26, incl	2.52 to 2.735, incl		
—Over 26 to 28, incl	2.73 to 2.945, incl		
—Over 28 to 30, incl	2.94 to 3.155, incl		
—Over 30 to 32, incl	3.15 to 3.365, incl		
—Over 32 to 34, incl	3.36 to 3.575, incl		
—Over 34 to 36, incl	3.57 to 3.785, incl		
—Over 36 to 38, incl	3.78 to 3.995, incl		
—Over 38 to 40, incl	3.99 to 4.205, incl		
—Over 40 to 42, incl	4.20 to 4.415, incl		
—Over 42 to 44, incl	4.41 to 4.625, incl		
—Over 44 to 46, incl	4.62 to 4.835, incl		
—Over 46 to 48, incl	4.83 to 5.045, incl		
—Over 48 to 50, incl	5.04 to 5.255, incl		
—Over 50 to 52, incl	5.25 to 5.465, incl		
—Over 52 to 54, incl	5.46 to 5.675, incl		
—Over 54 to 56, incl	5.67 to 5.885, incl		
—Over 56 to 58, incl	5.88 to 6.095, incl		
—Over 58 to 60, incl	6.09 to 6.305, incl		
—Over 60 to 62, incl	6.30 to 6.515, incl		
—Over 62 to 64, incl	6.51 to 6.725, incl		
—Over 64 to 66, incl	6.72 to 6.935, incl		
—Over 66 to 68, incl	6.93 to 7.145, incl		
—Over 68 to 70, incl	7.14 to 7.355, incl		
—Over 70 to 72, incl	7.35 to 7.565, incl		
—Over 72 to 74, incl	7.56 to 7.775, incl		
—Over 74 to 76, incl	7.77 to 7.985, incl		
—Over 76 to 78, incl	7.98 to 8.195, incl		
—Over 78 to 80, incl	8.19 to 8.405, incl		
—Over 80 to 82, incl	8.40 to 8.615, incl		
—Over 82 to 84, incl	8.61 to 8.825, incl		
—Over 84 to 86, incl	8.82 to 9.035, incl		
—Over 86 to 88, incl	9.03 to 9.245, incl		
—Over 88 to 90, incl	9.24 to 9.455, incl		
—Over 90 to 92, incl	9.45 to 9.665, incl		
—Over 92 to 94, incl	9.66 to 9.875, incl		
—Over 94 to 96, incl	9.87 to 10.085, incl		
—Over 96 to 98, incl	10.08 to 10.295, incl		
—Over 98 to 100, incl	10.29 to 10.505, incl		
—Over 100 to 102, incl	10.50 to 10.715, incl		
—Over 102 to 104, incl	10.71 to 10.925, incl		
—Over 104 to 106, incl	10.92 to 11.135, incl		
—Over 106 to 108, incl	11.13 to 11.345, incl		
—Over 108 to 110, incl	11.34 to 11.555, incl		
—Over 110 to 112, incl	11.55 to 11.765, incl		
—Over 112 to 114, incl	11.76 to 11.975, incl		
—Over 114 to 116, incl	11.97 to 12.185, incl		
—Over 116 to 118, incl	12.18 to 12.395, incl		
—Over 118 to 120, incl	12.39 to 12.605, incl		
—Over 120 to 122, incl	12.60 to 12.815, incl		
—Over 122 to 124, incl	12.81 to 13.025, incl		
—Over 124 to 126, incl	13.02 to 13.235, incl		
—Over 126 to 128, incl	13.23 to 13.445, incl		
—Over 128 to 130, incl	13.44 to 13.655, incl		
—Over 130 to 132, incl	13.65 to 13.865, incl		
—Over 132 to 134, incl	13.86 to 14.075, incl		
—Over 134 to 136, incl	14.07 to 14.285, incl		
—Over 136 to 138, incl	14.28 to 14.495, incl		
—Over 138 to 140, incl	14.49 to 14.705, incl		
—Over 140 to 142, incl	14.70 to 14.915, incl		
—Over 142 to 144, incl	14.91 to 15.125, incl		
—Over 144 to 146, incl	15.12 to 15.335, incl		
—Over 146 to 148, incl	15.33 to 15.545, incl		
—Over 148 to 150, incl	15.54 to 15.755, incl		
—Over 150 to 152, incl	15.75 to 15.965, incl		
—Over 152 to 154, incl	15.96 to 16.175, incl		
—Over 154 to 156, incl	16.17 to 16.385, incl		
—Over 156 to 158, incl	16.38 to 16.595, incl		
—Over 158 to 160, incl	16.59 to 16.805, incl		
—Over 160 to 162, incl	16.80 to 17.015, incl		
—Over 162 to 164, incl	17.01 to 17.225, incl		
—Over 164 to 166, incl	17.22 to 17.435, incl		
—Over 166 to 168, incl	17.43 to 17.645, incl		
—Over 168 to 170, incl	17.64 to 17.855, incl		
—Over 170 to 172, incl	17.85 to 18.065, incl		
—Over 172 to 174, incl	18.06 to 18.275, incl		
—Over 174 to 176, incl	18.27 to 18.485, incl		
—Over 176 to 178, incl	18.48 to 18.695, incl		
—Over 178 to 180, incl	18.69 to 18.905, incl		
—Over 180 to 182, incl	18.90 to 19.115, incl		
—Over 182 to 184, incl	19.11 to 19.325, incl		
—Over 184 to 186, incl	19.32 to 19.535, incl		
—Over 186 to 188, incl	19.53 to 19.745, incl		
—Over 188 to 190, incl	19.74 to 19.955, incl		
—Over 190 to 192, incl	19.95 to 20.165, incl		
—Over 192 to 194, incl	20.16 to 20.375, incl		
—Over 194 to 196, incl	20.37 to 20.585, incl		
—Over 196 to 198, incl	20.58 to 20.795, incl		
—Over 198 to 200, incl	20.79 to 21.005, incl		
—Over 200 to 202, incl	21.00 to 21.215, incl		
—Over 202 to 204, incl	21.21 to 21.425, incl		
—Over 204 to 206, incl	21.42 to 21.635, incl		
—Over 206 to 208, incl	21.63 to 21.845, incl		
—Over 208 to 210, incl	21.84 to 22.055, incl		
—Over 210 to 212, incl	22.05 to 22.265, incl		
—Over 212 to 214, incl	22.26 to 22.475, incl		
—Over 214 to 216, incl	22.47 to 22.685, incl		
—Over 216 to 218, incl	22.68 to 22.895, incl		
—Over 218 to 220, incl	22.89 to 23.105, incl		
—Over 220 to 222, incl	23.10 to 23.315, incl		
—Over 222 to 224, incl	23.31 to 23.525, incl		
—Over 224 to 226, incl	23.52 to 23.735, incl		
—Over 226 to 228, incl	23.73 to 23.945, incl		
—Over 228 to 230, incl	23.94 to 24.155, incl		
—Over 230 to 232, incl	24.15 to 24.365, incl		
—Over 232 to 234, incl	24.36 to 24.575, incl		
—Over 234 to 236, incl	24.57 to 24.785, incl		
—Over 236 to 238, incl	24.78 to 24.995, incl		
—Over 238 to 240, incl	24.99 to 25.205, incl		
—Over 240 to 242, incl	25.20 to 25.415, incl		
—Over 242 to 244, incl	25.41 to 25.625, incl		
—Over 244 to 246, incl	25.62 to 25.835, incl		
—Over 246 to 248, incl	25.83 to 26.045, incl		
—Over 248 to 250, incl	26.04 to 26.255, incl		
—Over 250 to 252, incl	26.25 to 26.465, incl		
—Over 252 to 254, incl	26.46 to 26.675, incl		
—Over 254 to 256, incl	26.67 to 26.885, incl		
—Over 256 to 258, incl	26.88 to 27.095, incl		
—Over 258 to 260, incl	27.09 to 27.305, incl		
—Over 260 to 262, incl	27.30 to 27.515, incl		
—Over 262 to 264, incl	27.51 to 27.725, incl		
—Over 264 to 266, incl	27.72 to 27.935, incl		
—Over 266 to 268, incl	27.93 to 28.145, incl		
—Over 268 to 270, incl	28.14 to 28.355, incl		
—Over 270 to 272, incl	28.35 to 28.565, incl		
—Over 272 to 274, incl	28.56 to 28.775, incl		
—Over 274 to 276, incl	28.77 to 28.985, incl		
—Over 276 to 278, incl	28.98 to 29.195, incl		
—Over 278 to 280, incl	29.19 to 29.405, incl		
—Over 280 to 282, incl	29.40 to 29.615, incl		
—Over 282 to 284, incl	29.61 to 29.825, incl		
—Over 284 to 286, incl	29.82 to 30.035, incl		
—Over 286 to 288, incl	30.03 to 30.245, incl		
—Over 288 to 290, incl	30.24 to 30.455, incl		
—Over 290 to 292, incl	30.45 to 30.665, incl		
—Over 292 to 294, incl	30.66 to 30.875, incl		
—Over 294 to 296, incl	30.87 to 31.085, incl		
—Over 296 to 298, incl	31.08 to 31.295, incl		
—Over 298 to 300, incl	31.29 to 31.505, incl		
—Over 300 to 302, incl	31.50 to 31.715, incl		
—Over 302 to 304, incl	31.71 to 31.925, incl		
—Over 304 to 306, incl	31.92 to 32.135, incl		
—Over 306 to 308, incl	32.13 to 32.345, incl		
—Over 308 to 310, incl	32.34 to 32.555, incl		
—Over 310 to 312, incl	32.55 to 32.765, incl		
—Over 312 to 314, incl	32.76 to 32.975, incl		
—Over 314 to 316, incl	32.97 to 33.185, incl		
—Over 316 to 318, incl	33.18 to 33.395, incl		
—Over 318 to 320, incl	33.39 to 33.605, incl		
—Over 320 to 322, incl	33.60 to 33.815, incl		
—Over 322 to 324, incl	33.81 to 34.025, incl		
—Over 324 to 326, incl	34.02 to 34.235, incl		
—Over 326 to 328, incl	34.23 to 34.445, incl		
—Over 328 to 330, incl	34.44 to 34.655, incl		
—Over 330 to 332, incl	34.65 to 34.865, incl		
—Over 332 to 334, incl	34.86 to 35.075, incl		
—Over 334 to 336, incl	35.07 to 35.285, incl		
—Over 336 to 338, incl	35.28 to 35.495, incl		
—Over 338 to 340, incl	35.49 to 35.705, incl		
—Over 340 to 342, incl	35.70 to 35.915, incl		
—Over 342 to 344, incl	35.91 to 36.125, incl		
—Over 344 to 346, incl	36.12 to 36.335, incl		
—Over 346 to 348, incl	36.33 to 36.545, incl		
—Over 348 to 350, incl	36.54 to 36.755, incl		
—Over 350 to 352, incl	36.75 to 36.965, incl		
—Over 352 to 354, incl	36.96 to 37.175, incl		
—Over 354 to 356, incl	37.17 to 37.385, incl		
—Over 356 to 358, incl	37.38 to 37.595, incl		
—Over 358 to 360, incl	37.59 to 37.805, incl		
—Over 360 to 362, incl	37.80 to 38.015, incl		
—Over 362 to 364, incl	38.01 to 38.225, incl		
—Over 364 to 366, incl	38.22 to 38.435, incl		
—Over 366 to 368, incl	38.43 to 38.645, incl		
—Over 368 to 370, incl	38.64 to 38.855, incl		
—Over 370 to 372, incl	38.85 to 39.065, incl		
—Over 372 to 374, incl	39.06 to 39.275, incl		
—Over 374 to 376, incl	39.27 to 39.485, incl		
—Over 376 to 378, incl	39.48 to 39.695, incl		
—Over 378 to 380, incl	39.69 to 39.905, incl		
—Over 380 to 382, incl	39.90 to 40.115, incl		
—Over 382 to 384, incl	40.11 to 40.325, incl		
—Over 384 to 386, incl	40.32 to 40.535, incl		
—Over 386 to 388, incl	40.53 to 40.745, incl		
—Over 388 to 390, incl	40.74 to 40.955, incl		
—Over 390 to 392, incl	40.95 to 41.165, incl		
—Over 392 to 394, incl	41.16 to 41.375, incl		
—Over 394 to 396, incl	41.37 to 41.585, incl		
—Over 396 to 398, incl	41.58 to 41.795, incl		
—Over 398 to 400, incl	41.79 to 42.005, incl		
—Over 400 to 402, incl	42.00 to 42.215, incl		
—Over 402 to 404, incl	42.21 to 42.425, incl		
—Over 404 to 406, incl	42.42 to 42.635, incl		
—Over 406 to 408, incl	42.63 to 42.845, incl		
—Over 408 to 410, incl	42.84 to 43.055, incl		
—Over 410 to 412, incl	43.05 to 43.265, incl		
—Over 412 to 414, incl	43.26 to 43.475, incl		
—Over 414 to 416, incl	43.47 to 43.685, incl		
—Over 416 to 418, incl	43.68 to 43.895, incl		
—Over 418 to 420, incl	43.89 to 44.105, incl		
—Over 420 to 422, incl	44.10 to 44.315, incl		
—Over 422 to 424, incl	44.31 to 44.525, incl		
—Over 424 to 426, incl	44.52 to 44.735, incl		
—Over 426 to 428, incl	44.73 to 44.945, incl		
—Over 428 to 430, incl	44.94 to 45.155, incl		
—Over 430 to 432, incl	45.15 to 45.365, incl		
—Over 432 to 434, incl	45.36 to 45.575, incl		
—Over 434 to 436, incl	45.57 to 45.785, incl		
—Over 436 to 438, incl	45.78 to 45.995, incl		
—Over 438 to 440, incl	45.99 to 46.205, incl		
—Over 440 to 442, incl	46.20 to 46.415, incl		
—Over 442 to 444, incl	46.41 to 46.625, incl		
—Over 444 to 446, incl	46.62 to 46.835, incl		
—Over 446 to 448, incl	46.83 to 47.045, incl		
—Over 448 to 450, incl	47.04 to 47.255, incl		
—Over 450 to 452, incl	47.25 to 47.465, incl		
—Over 452 to 454, incl	47.46 to 47.675, incl		
—Over 454 to 456, incl	47.67 to 47.885, incl		
—Over 456 to 458, incl	47.88 to 48.095, incl		
—Over 458 to 460, incl	48.09 to 48.305, incl		
—Over 460 to 462, incl	48.30 to 48.515, incl		
—Over 462 to 464, incl	48.51 to 48.725, incl		
—Over 464 to 466, incl	48.72 to 48.935, incl		
—Over 466 to 468, incl	48.93 to 49.145, incl		
—Over 468 to 470, incl	49.14 to 49.355, incl		
—Over 470 to 472, incl	49.35 to 49.565, incl		
—Over 472 to 474, incl	49.56 to 49.775, incl		
—Over 474 to 476, incl	49.77 to 49.985, incl		
—Over 476 to 478, incl	49.98 to 50.195, incl		
—Over 478 to 480, incl	50.19 to 50.405, incl		
—Over 480 to 482, incl	50.40 to 50.615, incl		
—Over 482 to 484, incl	50.61 to 50.825, incl		
—Over 484 to 486, incl	50.82 to 51.035, incl		
—Over 486 to 488, incl	51.03 to 51.245, incl		
—Over 488 to 490, incl	51.24 to 51.455, incl		
—Over 490 to 492, incl	51.45 to 51.665, incl		
—Over 492 to 494, incl	51.66 to 51.875, incl		
—Over 494 to 496, incl	51.87 to 52.085,		





**TABLE 10 Radii of Corners of Electric-Resistance Welds,  
Outsided Square and Rectangular Tubings<sup>A</sup> Square and  
Rectangular Tubing**

Squares and Rectangles Made from Final Outside Diameter Following the Diameter Ranges, in. <sup>B</sup>	Wall Thickness, BWG (in.) <sup>B</sup>	Radius at All Sides and Corners, ± in. <sup>C</sup>
1/2 to 1 1/2, incl	22 (0.028)	3/16 to
1/2 to 2 1/2, incl	20 (0.035)	1/32 to 1/16
1/2 to 2 1/2, incl	0.020 to 0.083, incl	0.004
1/2 to 4, incl	18 (0.049)	5/64 to
1/2 to 4 1/8, incl	16 (0.065)	1/16 to 7/64
1/2 to 4 1/8, incl	0.025 to 0.134, incl	0.005
to 4 1/8, incl	14 (0.083)	1/8 to 1/4
Over 1 1/8 to 1 1/2, incl	0.025 to 0.134, incl	0.006
Over 4 1/8 to 6, incl	14 (0.083)	1/2 to 1 to
		4 1/8, incl
Over 4 1/8 to 6, incl	14 (0.083)	1/2 to 2, incl
Over 4 1/8 to 6, incl	13 (0.095)	3/16 to 5/16
Over 2 to 3, incl	0.035 to 0.134, incl	0.010
1 1/4 to 4, incl	12 (0.109)	1/8 to 13/64
Over 3 to 4, incl	0.049 to 0.134, incl	0.020
Over 4 to 6, incl	12 (0.109)	3/16 to 5/16
Over 4 to 6, incl	0.065 to 0.134, incl	0.020
1 1/4 to 4, incl	11 (0.120)	1/8 to 7/32
Over 6 to 8, incl	0.085 to 0.134, incl	1/8 to 7/32

0.025

Over 4 to 6, in. clearance applies to the specific size determined at the corners, and is measured on the following basis:

Convexity and concavity: Tubes having two parallel sides are also measured in the center of the flat sides for convexity and concavity. This tolerance applies to the specific size determined at the corners, and is measured on the following basis:

Largest Nominal Outside Dimension, in.	Tolerance, Plus and Minus, in.
11 (0.120)	— 7/32 to 7/16
11 (0.120)	— 7/32 to 7/16
2 to 4, incl	10 (0.134)
2 1/2 and under	0.0134
Over 4 to 6, incl	10 (0.134)
Over 2 1/2 to 4	0.0134
Over 6 to 8, incl	10 (0.134)
Over 4 to 8	0.134

<sup>A</sup> This table establishes a standard radius. The purchaser and producer may negotiate special radii. Slight radius flattening is more pronounced in heavier wall tubing.

<sup>B</sup> 1 in. = 25 mm.

<sup>C</sup> These radius tolerances apply to grades of steel covered in Table 1. The purchaser and producer may negotiate tolerances on other grades of steel.

18.2 *Bar Coding*—In addition to the requirements in 18.1 bar coding is acceptable as a supplemental identification method. The purchaser may specify in the order a specific bar coding system to be used.

## 19. Packaging

19.1 On tubing 16 gage (1.65 mm nominal) and lighter, the producer will determine whether or not the tubing will be boxed, crated, cartoned, packaged in secured lifts, or bundled to ensure safe delivery unless otherwise instructed. Tubing heavier than 16 gage will normally be shipped loose, bundled, or in secured lifts. Special packaging requiring extra operations other than those normally used by a producer must be specified on the order.

## 20. Keywords

20.1 carbon steel tube; metallic-coated tubing; resistance welded steel tube; steel tube; welded steel tube

**TABLE 11 Length Tolerances of Electric-Resistance-Welded Square and Rectangular Tubing<sup>A</sup>**

Squares and Rectangles Made from Tubes of the Following Diameter Ranges, ft in. <sup>A,B</sup>	Wall Thickness, BWG (in.) <sup>B</sup>	Radius Ranges, in. <sup>C</sup>
1½ to 3, incl		± 1/16
½ to 1½, incl	22 (0.028)	± 1/32 to 1/16
Over 3½ to 4 2½, incl		± 1/32
½ to 2½, incl	20 (0.035)	± 1/32 to 1/16
Over 12½ to 20, incl		± 3/64 to 5/64
½ to 4, incl	18 (0.049)	± 3/64 to 5/64
½ to 4½, incl	16 (0.065)	1/16 to 7/64
Over 20¾ to 30, incl		± 5/64 to 1/8
¾ to 4½, incl	14 (0.083)	± 5/64 to 1/8
Over 4½ to 6, incl	14 (0.083)	3/16 to 5/16
Over 4½ to 6, incl	14 (0.083)	3/16 to 5/16
Over 30 to 40½, incl		± 3/32 to 5/32
1 to 4½, incl	13 (0.095)	± 3/32 to 5/32
Over 4½ to 6, incl	13 (0.095)	3/16 to 5/16
1¼ to 4, incl	12 (0.109)	1/8 to 13/64
Over 4 to 6, incl	12 (0.109)	3/16 to 5/16
1¼ to 4, incl	11 (0.120)	1/8 to 7/32
Over 4 to 6, incl	11 (0.120)	7/32 to 7/16
2 to 4, incl	10 (0.134)	5/32 to 9/32
Over 4 to 6, incl	10 (0.134)	7/32 to 7/16
Over 6 to 8, incl	10 (0.134)	3/8 to 5/8

<sup>A</sup> 1 ft = 0.3 m.

<sup>B</sup> 1 in. = 25.4 mm.

<sup>C</sup> These radius tolerances apply to grades of steel covered in Table 1. The purchaser and producer may negotiate tolerances on other grades of steel.

**TABLE 12 Twist Length Tolerances Electric-Resistance-Welded Square and Rectangular Mechanical Tubing**

Largest Dimension, in. <sup>A</sup>	Twist Tolerances, in-3 ft. <sup>B</sup> in. <sup>A</sup>
Under 1/2	0.032
1 to 3, incl	± 1/16
Over 3 to 12, incl	0.050
Over 12 to 20, incl	± 3/32
Over 20 to 30, incl	0.062
Over 30 to 40, incl	± 1/8
Over 40 to 60, incl	0.075
Over 60 to 80, incl	± 3/16
Over 80 to 100, incl	0.087
Over 100 to 120, incl	0.087
Over 120 to 140, incl	0.100
Over 140 to 160, incl	0.100 ± 1/4

<sup>A</sup> 1 in. = 25.4 mm.

<sup>B</sup> 1 ft in. = 0.2534 mm.

**TABLE 13 Twist Tolerances Electric-Resistance-Welded for Square and Rectangular Mechanical Tubing**

Largest Dimension, in. <sup>A</sup>	Twist Tolerance in 3 ft. <sup>B</sup> in. <sup>A</sup>
Under 1/2	0.032
Over 1/2 to 1½, incl	0.050
Over 1½ to 2½, incl	0.062
Over 2½ to 4, incl	0.075
Over 4 to 6, incl	0.087
Over 6 to 8, incl	0.100

<sup>A</sup> 1 in. = 25.4 mm.

<sup>B</sup> 1 ft = 0.3 m.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

*This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or [service@astm.org](mailto:service@astm.org) (e-mail); or through the ASTM website ([www.astm.org](http://www.astm.org)).*